

Interactive comment on “Molecular distributions of dicarboxylic acids, ketocarboxylic acids and α -dicarbonyls in biomass burning aerosols: implications for photochemical production and degradation in smoke layers” by S. Kundu et al.

Anonymous Referee #2

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In this work the authors measure the abundance of carboxylic acids and dicarbonyls in biomass burning plumes. Filter samples are obtained from the LBA-SMOCC campaign in the Amazonia and the water-soluble components are analyzed. Oxalic acid is confirmed to be the most abundant of the detected acids. Results indicate that oxalic acid maybe formed from the degradation of dicarboxylic species in the daytime. However, the abundance of dicarboxylics samples in daytime samples compared to biomass burning tracers suggest additional dicarboxylics are formed via photochemical production.

The findings regarding the degradation pathways of biomass burning plumes are novel. The paper provides further evidence that biomass burning is a significant source of dicarboxylics and carbonyls. Furthermore it presents concentrations, ratios, and values that are relevant and of use to the atmospheric community. The authors do a nice job of citing relevant papers. This reviewer has only a few concerns and they are as follows:

MAJOR CONCERNS

The definitions of Low molecular weight (LMW) and high-molecular weight (HMW) compounds are somewhat ambiguous. Compounds less than 500 g mol⁻¹ are commonly considered LMW, however C₅ molecules that may be less than 500 g mol⁻¹ are defined as HMW in this paper. It would be beneficial to the larger scientific community to report the findings in comparable terms to already published molecular weight literature. Perhaps the simple modification to Smaller-MW and Larger-MW compounds would suffice?

Have the authors considered temperature effects on the rates of formation/degradation? The authors suggest photochemical pathways to explain their observations but the difference in daytime and nighttime temperatures may also affect acid formation rates.

Were the fires more prominent in the day versus night? If so, it could also explain observations; in other words, a decrease in carboxylics would be expected for less biomass burning particles at night when sunlight was not present. Furthermore correlations with EC/OC/K₊ are systematically weaker at night, suggesting biomass plumes are not prevalent. How did the total particulate matter vary diurnally? Were changes in boundary height (i.e. changes in ambient concentrations) accounted for in the analysis?

MINOR CONCERNS

P 19785L26 . Asa-Awuku et al. 2008 also present data of CCN activity of WSOC from Biomass Burning Aerosol. Furthermore (P19786 L3) they show that the “hydrophobic-

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long chained” species and inorganic components in the biomass sample have CCN activity greater than that of ammonium sulfate. The CCN activity also correlates with the ability of WSOC to significantly depress surface tension in the presence of salts.

P 19786 L26. Replace “Sapporo” with “Sapporo, Japan”

P19793 L11. The sentence beginning with “Alternatively, . . .” is very long and confusing. The authors should consider revising it.

PL19795 L26. What is meant by normal?

REFERENCES: Asa-Awuku, A., A. P. Sullivan, C.J. Hennigan, R. J. Weber and A. Nenes, Investigation of Molar Volume and Surfactant Characteristics of water-soluble Organic Compounds in Biomass Burning Aerosol, Atmospheric Chemistry and Physics, 8, 799-812, 2008

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 19783, 2009.

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